BIOCHEMISTRY, PH.D.

Biochemistry is the study of biological molecules, their roles in the cell, and the chemistry of their reactions in living systems. The Integrated Program in Biochemistry (IPiB) is the merged graduate program between the Department of Biochemistry (in the College of Agricultural and Life Sciences) and the Department of Biomolecular Chemistry (in the School of Medicine and Public Health). The program trains the next generation of biochemists and prepares them for 21st Century challenges in science. IPiB offers a Ph.D. degree with a major in biochemistry. Although an M.S. degree is officially offered, students are not admitted for a terminal master's degree.

From atoms and cells to plants and animals, biochemistry research in IPiB is at the forefront of modern science. We are home to around 100 graduate students and 52 world-class faculty pursuing cutting-edge research in all areas of biochemistry, including: cell and developmental biology, chemical biology, endocrinology, enzymology, immunology, metabolism, molecular genetics, molecular medicine, physical biochemistry and biophysics, quantitative biology, structural biology, systems and synthetic biology, and virology. The program teaches critical thinking skills, applicable to a wide range of professional fields that students pursue after graduation.

The size and breadth of IPiB provide unique opportunities for graduate students who want to pursue a degree in one of the top biochemistry graduate programs in the nation. Our modern facilities are filled with labs carrying out groundbreaking research in a collaborative, friendly, and inspirational atmosphere. Welcome to IPiB and we hope that you can share our enthusiasm for the biochemical sciences!

DUAL DEGREES

The program participates with the School of Medicine and Public Health in offering a joint program for students wishing to complete both the M.D. and Ph.D. degrees. The basic prerequisites and degree requirements for the Ph.D. in the M.D./Ph.D. program are identical to those for the major in biochemistry; however, the minor may be taken in medical sciences. For the prerequisites and degree requirements for the M.D. degree, as well as the online application form, see Medical Scientist Training Program (http://mstp.med.wisc.edu).

ADMISSIONS

To qualify for admission to IPiB, an applicant must complete a bachelor's degree at a recognized, accredited college or university. The basic background for graduate study in biochemistry ordinarily would be provided by an undergraduate degree in biochemistry, chemistry, physics, or in one of the biological or medical sciences. Coursework in biochemistry, organic chemistry, physics, and physical chemistry is required. (Admission might be granted without one or more of these course requirements, but the deficiency must be made up within the student's first two years of graduate study.) The applicant's undergraduate grade point average must be at least 3.0 (4.0 scale). For more information, please visit the Prospective Students (https://ipib.wisc.edu/p_students.php) tab on the IPiB website.

GRADUATE SCHOOL ADMISSIONS

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

PROGRAM RESOURCES

IPiB students receive a full stipend ($28,000 for 2018-19), as well as tuition remission and comprehensive health insurance. The stipends take the form of traineeships, research assistantships, or fellowships, and are guaranteed for all IPiB Ph.D. candidates in good academic standing. IPiB also assists its graduate students with outstanding academic records in competing for University or national awards.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Mode of Instruction</th>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

Evening/Weekend: These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

Online: These programs are offered primarily online. Many online courses can be completed almost entirely online with all online courses offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

Hybrid: These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

Accelerated: These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.
CURRICULAR REQUIREMENTS

Minimum Credit Requirement 54 credits

Minimum Residence Credit Requirement 42 credits

Minimum Graduate Coursework Requirement All coursework must be completed graduate-level course; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide.

Overall Graduate GPA Requirement 3.00 GPA required.

Other Grade Requirements The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

Assessments and Examinations Deposit of the doctoral dissertation in the Graduate School is required.

Language Requirements n/a

Doctoral Minor/Breadth Requirements Doctoral students must complete IPiB’s required coursework plus a minimum of 6 credits of approved breadth coursework in the physical, biological, and/or quantitative sciences. Students who opt for the Option A (focused) doctoral minor must complete IPiB’s required coursework, the minor requirements of the minor program, and a minimum of 6 credits of approved breadth coursework in the physical, biological, and/or quantitative sciences.

REQUIRED COURSES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM 660</td>
<td>Methods in Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>BIOCHEM/</td>
<td>Professional Responsibility</td>
<td>1</td>
</tr>
<tr>
<td>BMOLCHEM 701</td>
<td></td>
<td></td>
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<tr>
<td>BIOCHEM 729</td>
<td>Advanced Topics (From Atoms to Molecules)</td>
<td>3</td>
</tr>
<tr>
<td>BMOLCHEM 720</td>
<td>Experimental Design and Paradigms in Cellular Biochemistry and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOCHEM 990</td>
<td>Research</td>
<td>1-12</td>
</tr>
</tbody>
</table>

Breadth Requirements

Students must complete a minimum of two additional graduate level (600 or above or that carry the graduate attribute) didactic or laboratory courses in order to fulfill their breadth requirements, and a minimum of 6 total credits is required. Courses must be chosen from at least 2 of the following categories: physical sciences, biological sciences, or quantitative sciences. One-credit seminars do not count toward the breadth requirements.

BIOCHEM 601 Protein and Enzyme Structure and Function
BIOCHEM/B M I/BMOLCHEM/MATH 606 Mathematical Methods for Structural Biology
BIOCHEM/B M I/BMOLCHEM/MATH 609 Mathematical Methods for Systems Biology
BIOCHEM/GENETICS/MICROBIO 612 Prokaryotic Molecular Biology
BIOCHEM/NUTR SCI 619 Advanced Nutrition: Intermediary Metabolism of Macronutrients
BIOCHEM/GENETICS/MD GENET 620 Eukaryotic Molecular Biology
BIOCHEM/BOTANY 621 Plant Biochemistry
BIOCHEM 625 Mechanisms of Action of Vitamins and Minerals
BIOCHEM/PHMCOL-M/ZOOLOGY 630 Cellular Signal Transduction Mechanisms
BIOCHEM/NUTR SCI 645 Molecular Control of Metabolism and Metabolic Disease
BIOCHEM 660 Methods in Biochemistry
BIOCHEM/ CHEM 665 Biophysical Chemistry
BIOCHEM/ CHEM 704 Chemical Biology
BIOCHEM/ MICROBIO 726 Regulation of Gene Expression in Prokaryotes
BIOCHEM 729 Advanced Topics (IPiB Seminar) or BMOLCHEM 920 Biomolecular Chemistry Seminar
BIOCHEM 729 Advanced Topics (Practicum in Undergraduate Teaching)
BIOCHEM 729 Advanced Topics (From Atoms to Molecules)
BIOCHEM 729 Advanced Topics (Foundations of Biotechnology)
BIOCHEM 729 Advanced Topics (Responsible Conduct of Research)
BIOCHEM 729 Advanced Topics (Membrane Protein Structure and Function (Advanced))
BIOCHEM 799 Practicum in Biochemistry Teaching
BMOLCHEM/ CHEM 627 Methods and Technologies for Protein Characterization
BMOLCHEM/ BIOCHEM 701 Professional Responsibility
BMOLCHEM 720 Experimental Design and Paradigms in Cellular Biochemistry and Molecular Biology
M M & I/ BIOCHEM 575 Biology of Viruses
POLICIES

GRADUATE SCHOOL POLICIES
The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK
The Graduate Program Handbook (https://ipib.wisc.edu/c_students_handbook.php) is the repository for all of the program’s policies and requirements.

Prior Coursework

Graduate Work from Other Institutions
For well-prepared advanced students, the Program may accept up to 6 credits of prior graduate coursework from other institutions towards the minimum graduate degree credit and minimum graduate coursework (50%) requirement. The minimum graduate residence credit requirement can be satisfied only with courses taken as a graduate student at UW–Madison.

UW–Madison Undergraduate
No credits from a UW–Madison undergraduate degree are allowed to count toward the graduate degree.

UW–Madison University Special
No credits taken as a University Special student are allowed to count toward the graduate degree.

PROBATION
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
Every graduate student must have an IPiB faculty thesis advisor. The thesis advisor advises the student about coursework, supervises the student’s research, and acts as a mentor to the student through the student’s graduate career. The thesis advisor must approve the student’s coursework before registration for a given semester and must also approve any subsequent changes to it.

A Ph.D. thesis committee is composed of at least four graduate University faculty members, including the thesis advisor. The thesis committee is empowered by the Program to advise the student about certification, administer the preliminary examination, oversee annual progress reports, approve thesis composition, and conduct the final Ph.D. examination.

CREDITS PER TERM ALLOWED
12 credits

TIME CONSTRAINTS
Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

OTHER
IPiB students receive a stipend ($27,000 in 2017-18) in addition to fringe benefits and tuition. Competitive fellowships and traineeships are also available. Students may matriculate only in the fall semester, and a master’s degree is not offered as a terminal degree.

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

LEARNING OUTCOMES
1. Gain a broad understanding of the biochemical principles that underlie all biological processes.

2. Become aware of the current limitations of the state of understanding of this discipline and the strategies that are required to advance the field.

3. Formulate and design new approaches that extend and apply biochemical principles beyond their current boundaries.


5. Think critically to address research challenges using a broad range of the theories, research methods, and approaches to scientific inquiry.

6. Collaborate with investigators within the program, university, and beyond since current and future advances in the biomolecular sciences demand interdisciplinary skills.

7. Foster professional and ethical conduct in the sciences, including but not limited to: exposition of the scientific method; ethical design of experimental protocols; reproducibility in science; professional behavior in industrial, government, and academic settings; documentation of scientific results; communication to other scientists and the public; peer review; and confidentiality.

8. Develop communications skills that enable the articulation of research to fellow scientists and non-scientists.
9. Explore career development opportunities in industry, government and academia to realize professional goals and paths.

10. Develop teaching and mentoring skills in both lecture and laboratory settings.

**PEOPLE**

**Faculty:** Professors B. Fox (Chair, Department of Biochemistry), Kiley (Chair, Department of Biomolecular Chemistry), Amasino, Ansari, Attie, Audhya, Bednarek, Brow, Butcher, Chanda, Clagett-Dame, Coon, Cox, Craciun, Craig, Denu, Dvinge, Engin, C. Fox, Friesen, Harrison, Hayes, Henzler-Wildman, Holden, Hoskins, Hull, Keck, Kimble, Landick, Lewis, Markley, Martin, Merrins, Mitchell, Mosher, Ntambi, Pagliarini, Palmenberg, Pike, Ralph, Raman, Rayment, Record, Romero, Senes, Sheets, Sussman, Venturelli, Wang, Weibel, Wickens, Wildonger